
The Emergency Department in Surveillance of Attempted Suicide: Findings and Methodologic Considerations

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Synopsis

The authors conducted one of the first active, population-based public health surveillance systems for detecting suicide attempts in the United States.

Surveillance was conducted in all four hospital emergency departments serving a county suburban to Atlanta, GA, with a population of 426,000. Emergency department staff gathered information from all patients who presented with an intentionally self-inflicted injury (suicide attempt) or with thoughts about self-injury (suicidal ideation).

During an 18-month period in 1988 and 1989, 798 suicide attempt-related patients were reported, for a rate of 124.7 per 100,000 county residents per year. Females had a higher attempted suicide rate than males, but males had a higher completed suicide rate. Ingestion of drugs or poison was the most common method of attempted suicide (71.1 percent), and use of firearms was the most common method of completed suicide (69.8 percent). In comparing reported cases with those found by reviewing emergency department log books, the authors found that the case reports were 58 percent complete and that surveillance reporting was highly representative of all cases requiring emergency transport.

The authors conclude that emergency department-based surveillance for attempted suicide is feasible. It can provide representative data that may be used to monitor trends in attempted suicide and to define high-risk groups. Such surveillance may also allow timely detection of suicide attempt clusters, facilitating prompt intervention.

IN 1988, more than 30,000 Americans committed suicide (1). Since attempted suicide is a risk factor for eventual completed suicide (2,3), attempters represent one population to which suicide prevention efforts may effectively be directed. In addition to being a marker of risk for suicide, suicide attempts are also morbid health events that exact physical, emotional, and economic tolls on members of the community. A suicide attempt may be an indicator of alcoholism and other drug use or

an underlying mental illness (4-6). Several attempted suicides occurring in close geographic and temporal proximity may indicate the need for a crisis response (7).

Whereas completed suicides can be counted and studied on a population basis through analysis of mortality data, attempted suicides are not as easy to study because few ongoing data collection systems provide statistics on such events. Available data are generally based on periodic national and

local surveys (4,8), as well as studies of patients under psychiatric care (9,10).

Studies based on psychiatric inpatients may not be generalizable to nonpsychiatric patient populations, and such studies generally do not permit estimates of the incidence of suicide attempts. Surveys of the general population can theoretically provide population-based estimates of the incidence of attempted suicide. Unfortunately, most surveys to date have relied on the respondents' own definitions of "attempted suicide," and mounting evidence indicates that only a small proportion of those who report having attempted suicide in such surveys actually have taken any substantive action to injure themselves (11); only a very small proportion are even seen by medical personnel (11,12). In addition, most surveys have been designed to give a one-time point estimate of incidence, not to provide incidence data on an ongoing and timely basis.

We developed an emergency department-based surveillance system to count and characterize cases of attempted suicide in Cobb County, GA, (a) to monitor trends and patterns in the epidemiology of attempted suicide on an ongoing basis and (b) to determine the feasibility of hospital-based suicide attempt surveillance. In this paper, we describe the surveillance system and analyze its completeness. We also review some of the data on attempted suicide collected by the surveillance system, compare them with data on completed suicide, and discuss how the data may be linked to suicide prevention activities.

Background

Cobb County is suburban to Atlanta; its population of 426,741 (1988 estimate) is 92 percent white. The county has four general hospitals with 1,096 total beds and 43,744 hospital discharges as of 1984 (13). There were 57 suicide deaths in the county in 1986 and 68 by December 1987, when the attempted suicide surveillance system was being designed. Suicide has been a special concern to county health officials because, from 1980 to 1984, Cobb County had the second highest age- and sex-adjusted suicide mortality rate in Georgia (14.5 per 100,000) (13). In addition, county health officials perceived that the number of suicide attempts had increased in recent years, especially among teenagers. Several highly publicized suicides of high school students in recent years had caused concern and prompted a need for timely and accurate data on the problem. This surveillance system was designed as a practical, ongoing system of data

collection, analysis, and dissemination, rather than as a special study. It is still functioning.

Methods

Emergency department surveillance system—case definitions. Suicidal patients were defined as Cobb County residents who presented alive to the emergency department (ED) with either (a) an intentional, self-inflicted injury or poisoning, which could be of any severity from trivial to severe (suicide attempt) or (b) thoughts or concerns about intentional self-injury but without actual infliction of self-injury (suicide ideation).

During inservice training sessions for ED personnel, existing data on attempted suicide were presented, and the purpose of the surveillance system was explained. A pilot phase was conducted at one site during which the data collection form was developed. In the surveillance system, ED personnel were asked to complete a data form for each possible suicide-related ED visit. To determine the full spectrum of suicide-related visits to EDs, the staff completed forms for any patient presenting with suicidal ideation or with an injury or poisoning (however trivial or serious) from attempted suicide. In addition to defining the spectrum of suicidal behavior, those with suicidal ideation only were also enumerated for possible later study of risk factors for attempted or completed suicide. At most sites a nurse was designated on each work shift to complete surveillance data forms and to review the ED log for possible missed cases. The ED physician's judgment that a patient was suicidal was accepted.

The data collection form is figure 1. On the form, nature of injury categories were taken from the International Classification of Diseases coding scheme (14). Questions on evidence of intent to commit suicide were taken from a set of recommended criteria (15). To protect confidentiality, identifying information was kept in a log book in the hospital and was not available for analysis at the health department. Each hospital designated a surveillance coordinator who reviewed the ED discharge log daily for diagnoses possibly related to suicide (for example, "overdose"), kept the ED staff vigilant through frequent reminders, and collected the completed data forms. Monthly reports of study data were made available to each site to maintain ED staff interest and involvement.

For this report, data were reviewed for the 18-month period from June 1, 1988, through November 30, 1989. For patients with more than one

Figure 1. Form for collecting data

DEMOGRAPHIC INFORMATION

Hospital #: _____ Patient ID #: _____ Initials: _____

Date of Birth: ___/___/___ Age: _____ Date of ED Visit: ___/___/___

Residence - Town: _____ County: _____

Zip Code: _____ Street: _____

Sex: Male
 Female

Race/Ethnic: White
 Black
 Latin (e.g. Hispanic, Chicano)
 Asian descent
 Undetermined

If student, name of school: _____

INCIDENT INFORMATION

1. Mode of arrival: (Check one)

- A. Ambulance
- B. Self
- C. Family
- D. Friend
- E. Police
- F. Other
- G. Unknown

2. Mental Status: (Check one)

- A. Alert
- B. Confused
- C. Comatose
- D. Blank

3. Nature of Injury

(Check for primary and/or secondary injury, including suspected injury)

- | 1st | 2nd | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | A. Poisoning by ingestion of solids or liquids |
| <input type="checkbox"/> | <input type="checkbox"/> | B. Poisoning by inhalation of gases or vapors |
| <input type="checkbox"/> | <input type="checkbox"/> | C. Injury by hanging, strangulation or suffocation |
| <input type="checkbox"/> | <input type="checkbox"/> | D. Injury by firearms (guns) |
| <input type="checkbox"/> | <input type="checkbox"/> | E. Injury by cutting instruments (knives, etc.) |
| <input type="checkbox"/> | <input type="checkbox"/> | F. Injury by crashing a vehicle |
| <input type="checkbox"/> | <input type="checkbox"/> | G. Other, specify _____ |
| <input type="checkbox"/> | <input type="checkbox"/> | H. None |
| <input type="checkbox"/> | <input type="checkbox"/> | I. Unknown |

	Primary	Secondary
For Poisonings: Substance ingested or inhaled	_____	_____
Amount (# of pills, etc.)	_____	_____
For Injuries: Anatomic Location (wrist, etc.)	_____	_____

4. ED Discharge Diagnosis (from ED Chart) _____

5. Concurrent Drug Use (Please check all that apply)

- A. Alcohol
- B. Marijuana
- C. Cocaine
- D. Other _____
- E. None
- F. Unknown

continued

Figure 1. Form for collecting data (continued)

6. Evidence of intent to commit suicide: (Check an answer for each.)

Yes No Did not ask

- | | | | |
|--------------------------|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | A. Explicit statement of intent, verbal or written |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | B. Expressions of farewell or desire to die |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | C. Precautions to avoid rescue |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | D. History of previous suicide attempt |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | E. History of previous suicide threat |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | F. History of stressful events or significant loss |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | G. History of serious depression or mental disorder |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | H. The injury cannot be explained in any other way |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | I. Other (specify) _____ |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | J. None |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | K. Unknown |

7. Disposition: Check A, B, C, or D; and answer other questions for that part.

- A. Admitted to this hospital:**
 - Medicine
 - Surgery
 - ICU/CCU
 - Psychiatry
 - Other _____
- B. Transferred to another facility:**
 - Georgia Regional Hospital
 - Inpatient detox. program
 - Other _____
- C. Discharged home:**
 - Cobb/Douglas Mental Health
 - Other mental health referral: _____
 - Social service referral, agency: _____
 - Left against medical advice
 - Other: _____
- D. Died in ED.**

8. Degree of certainty that suicide attempt occurred: (Check one)

- A. Certain
- B. Possible, likely
- C. Possible, unlikely
- D. Expression of suicidal thoughts only

9. Was the attempt life-threatening? (Check one)

- A. Yes
- B. Possibly
- C. No
- D. Not applicable (expression of suicidal thoughts only)

10. Have you ever received counseling in the past? Yes No

If yes, name of center? _____

Numbers and rates¹ of suicidal ideation, suicide attempts, and completed suicide, Cobb County, GA, June 1988 through November 1989

Age group (years)	Suicidal ideation			Attempted suicide			Suicidal ideation and attempts			Completed suicide		
	Number	Percent	Rate ¹	Number	Percent	Rate ¹	Number	Percent	Rate ¹	Number	Percent	Rate ¹
Unknown	1	0	0	5	1	0	6	1	0	0	0	0
Younger than 10 .	2	1	2.2	1	0	1.1	3	0	3.2	0	0	0
10-1	14	6	31.5	53	9	119.4	67	8	151.0	0	0	0
15-19	32	14	76.2	133	23	316.8	165	21	393.0	7	7	16.7
20-24	37	16	68.9	88	15	163.8	125	16	232.7	4	4	7.4
25-34	65	29	44.0	127	22	86.0	192	24	129.9	29	30	19.6
35-44	46	20	38.6	108	19	90.6	154	19	129.2	23	24	19.3
45-54	19	8	30.3	41	7	65.4	60	8	95.8	13	14	20.8
55-64	8	4	21.6	9	2	24.3	17	2	45.8	10	10	27.0
65 and older	4	2	9.8	5	1	12.2	9	1	22.0	10	10	24.4
Total	228	100	35.6	570	99	89.0	798	100	124.7	96	99	15.0

¹ All rates are expressed as number of cases per 100,000 persons per year.

ED visit for attempted suicide during that period, only the first visit was included in the analysis to avoid double counting patients.

Validation and completeness of surveillance. All four hospitals' emergency departments in the county participated in the surveillance system. To assess the extent to which county residents who attempted suicide sought emergency care outside of the county, we reviewed ambulance trip reports maintained at the county health department. Copies of trip reports for all ambulance transports originating in the study county are filed with the county health department. We used these data to determine the number of patients transported by ambulance from within the county to hospitals outside the county during the period from June 1, 1988, through July 31, 1988. We reviewed all ambulance trip reports for patients with provisional diagnoses of suicide attempt, medicine misuse, anxiety, depression, and other psychiatric conditions.

The completeness of submission of ED data forms for attempted suicide was assessed by an independent review of each hospital ED log. Log books in three of the four general hospital EDs were reviewed for the 2nd, 6th, and 11th months of the first year of reporting. In the fourth hospital, log book records were available only for the sixth month. For patients whose discharge diagnosis was possibly related to suicidal behavior (suicide, suicide attempt, suicide ideation, drug overdose, depression, gunshot wound, wrist laceration, inhalation of carbon monoxide, other ingestion, jump or fall from height), the corresponding ED medical record was reviewed to determine if the case definition was met. Reported cases that were not consistent with the case definition (false-positives)

and possible cases that were not reported (false-negatives) were identified.

Suicide mortality. We obtained data on completed suicides among county residents during the study period from the Cobb County medical examiner's office. The medical examiner investigates all deaths in the county that are due to suicide and those that are violent, suspicious, or unexplained. To calculate rates, we used population projections for 1988.

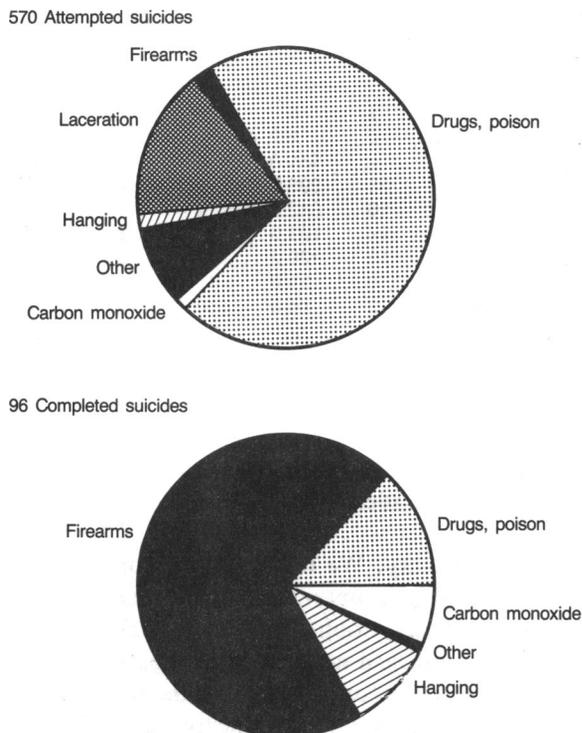
Results

Suicide attempt data. During the 18-month study period, 798 Cobb County residents were reported from EDs for attempted suicide or suicidal ideation; 570 (71 percent) of these patients were classified as suicide attempters and 228 (29 percent) expressed suicidal ideation (see table). The overall rate of suicide-related ED visits was 124.7 per 100,000 per year. During the same period, 96 deaths of county residents due to suicide were recorded by the medical examiner's office, a rate of 15.0 per 100,000 per year. Thus, more than eight suicide-related ED visits occurred for each suicide death.

The highest age-specific rate of suicide-related ED visits—393 per 100,000 per year—was for the 15-19-year-old age group (see table). For females in this age group, the rate was 506.0, and for males, it was 286.1. Rates of suicide-related ED visits declined in older age groups to levels comparable to those of completed suicide in persons older than 64 years. The rate of suicide-related visits was 202.2 per 100,000 per year for blacks and 120.2 per 100,000 per year for whites.

We observed marked differences in the methods

Figure 2. Methods of attempted and completed suicides, Cobb County, June 1988 through November 1989



used by suicide attempters and suicide completers (fig. 2). Ingestion of drugs was the most common method employed by persons who attempted suicide (71.1 percent), with the most common substances ingested being antianxiety and sedative-hypnotic drugs (22 percent), nonnarcotic analgesics (16 percent), and cold preparations and antidepressants (8 percent each). Among suicide attempters, laceration was the second most common method used (15.6 percent), with use of firearms being one of the least common methods (2.3 percent). Conversely, the use of firearms was by far the most common method used by persons who completed suicide (69.8 percent), followed by drug overdose or poisoning (13.5 percent). Data on suicidal intent were recorded on only 50–60 percent of surveillance forms and were not analyzed in detail.

Validation and completeness of surveillance. During the 2-month period when we reviewed county ambulance trip reports, 45 patients were transported for suicide attempts. Of these, 43 were taken to one of the EDs participating in the study. An additional 21 patients were transported by ambulance for other psychiatric conditions or for misuse of medications; none were taken outside the

county. Thus, of 66 identified patients, 64 (97 percent) were transported to a hospital within the county. During this 2-month period, 35 percent of the case patients reported to the surveillance system arrived by ambulance.

The independent review of ED log books to examine completeness of reporting identified 295 patient visits with a diagnosis suggestive of suicide. Of the 295 records reviewed, 139 met the case definition and 156 did not. Of the 139 cases, 81 were reported to the surveillance system, yielding an estimated sensitivity of 58 percent. The sex and age distribution of persons not reported to the system was similar to those who were reported. The sensitivity ranged from a low of 40 percent in one hospital to a high of 72 percent. Of the 156 possible case patients who did not meet the case definition, only 7 were reported to the surveillance system, for an estimated specificity of 96 percent.

The activities involved in conducting surveillance for attempted suicide did add a work burden for ED staff. However, ED staff interest and enthusiasm was maintained through monthly data summaries. The surveillance system has continued beyond the period reported in this paper with a data form shortened to contain what were felt to be the most important and readily obtainable data (fig. 3).

Discussion

Traditional public health surveillance for communicable diseases, which relies on timely, population-based reporting of health events by health care workers, hospitals, and laboratories, has been expanded in recent years to include other conditions such as lead poisoning (16) and occupational diseases (17). Disease surveillance reporting to local public health agencies allows communities to assess their disease control needs, establish priorities, and evaluate their intervention programs (18). If reporting is timely, public health officials have the opportunity to intervene rapidly with measures to prevent secondary cases (19). A framework for evaluating public health surveillance systems has been provided by the Centers for Disease Control and Prevention including examining sensitivity, specificity, cost, flexibility, and acceptability to reporters (20).

In this paper, we report one of the first active, population-based public health surveillance systems for detecting nonfatal suicidal behavior in the United States. In studying suicide and suicidal behavior, investigators generally have relied on mortality data or self-reported survey data, devot-

Figure 3. Revised data form for ongoing surveillance

SUICIDE DATA COLLECTION FORM

Patient ID #: _____ Initials of case: _____ Consent signed: Yes No

Date of Birth: ____/____/____ Age: _____ Sex: Male Female

Date of admission: ____/____/____

Residence - Town: _____ County: _____
Zip Code: _____ Street: _____

If student, name of school: _____

If student in Cobb County School System,
was Prevention-Intervention Center referral given? Yes No

INCIDENT INFORMATION

1. Mental Status: (Check one)

- A. Alert
- B. Confused
- C. Comatose
- D. Other _____

2. Concurrent Drug Use

(Please check all that apply)

- A. Alcohol
- B. Marijuana
- C. Cocaine
- D. Other _____
- E. None
- F. Unknown

3. Nature of Injury

(Check primary method of injury)

- A. Poisoning by ingestion of solids or liquids
- B. Poisoning by inhalation of gases or vapors
- C. Injury by hanging, strangulation or suffocation
- D. Injury by firearms (guns)
- E. Injury by cutting instruments (knives, etc.)
- F. Injury by crashing a vehicle
- G. Other, specify _____

4. Disposition: (Check one)

- A. Admitted to this facility
- B. Transferred to another inpatient facility: _____
- C. Referred to public mental health center
- D. Referred to private psychiatric services
- E. Discharged home
- F. Died in ED.

5. Was this attempt life-threatening?

- A. No: injury/toxicity was superficial, transient, or self-limited.
- B. Perhaps: injury/toxicity required treatment, but was not life-threatening in itself.
- C. Yes: injury/toxicity was likely to have been life-threatening without treatment.

6. In your judgement, was this patient definitely trying to kill himself/herself? (Check one)

- A. Yes
- B. No
- C. Uncertain
- D. Expression of suicidal thoughts only

*To be filled out by Study Personnel only: Student Tracking Number: _____
School Code: ____|_____

'In this paper, we report one of the first active, population-based public health surveillance systems for detecting nonfatal suicidal behavior in the United States. In studying suicide and suicidal behavior, investigators generally have relied on mortality data or self-reported survey data,'

ing little effort to gathering population-based data on a timely basis at the local level where suicide prevention programs are usually based. We found that local health departments can implement and manage an ED-based surveillance system for suicide attempt and suicidal ideation in a manner consistent with traditional public health surveillance for other conditions such as communicable diseases.

Suicidal behavior can range from minor, self-injurious acts to lethal behaviors. Although we included all persons presenting for suicidal ideation as well as for injuries, our surveillance system probably captured the more severe end of this spectrum; patients with severe, life-threatening injuries must necessarily present to EDs for medical care, whereas suicide attempters with minor or no injuries may or may not present at hospital EDs.

In our analysis of the surveillance data, we observed similarities in the demographic patterns of suicide attempts and the relationships with completed suicide described by others using different methods of research (8,10). Females, while at less risk than males for completed suicide, have a greater rate of attempted suicide. Ingestion of drugs or poison is the most common method used in suicide attempts, whereas firearms is the most common method used in completed suicides.

For the 35 percent of case patients who were transported to the ED by ambulance, the surveillance system was highly representative of suicide-related ED visits by Cobb County residents: very few were transported to hospitals outside the county. Although we were unable to measure the representativeness of the system for the other 65 percent of patients, these results suggest that there is no strong tendency, due to geographic locations of hospitals or other causes, for county residents to use hospitals in neighboring counties. This is important for others considering implementing such an ED-based surveillance system. Such a system may be less representative if many patients are

transported across jurisdictional lines to receive emergency care.

Within the hospital EDs, 58 percent of suicide attempts, determined through a review of the ED log and medical records, were reported to the surveillance system. Patients who were seen in the ED but missed by the surveillance system had a similar age and sex distribution to those who were not missed, however, suggesting that the representativeness of the system was not significantly compromised by the low sensitivity. The surveillance system clearly would be improved if its level of sensitivity were increased. In fact, since the pilot program ended, several steps have been taken toward that end. Nevertheless, a sensitivity of 58 percent is equal to or better than that seen in many traditional public health surveillance systems (21,22). The ED log book itself did not prove to be an adequate tool to track attempted suicide because it typically contains only basic demographic information and a one-word diagnosis which often was not specific.

The surveillance system was well accepted by the ED staff because of its potential public health significance and because the surveillance forms reminded ED staff of the appropriate questions to ask potentially suicidal patients. However, filling out data forms for the surveillance system presented an additional burden to a busy ED staff. Knowing that this factor might limit reporting sensitivity, we simplified the data forms after the study period ended (fig. 3).

Other surveillance strategies might be employed to detect attempted suicide cases in private physicians' offices, at hospitals outside the county, or at inpatient psychiatric facilities. In Oregon, for example, physicians and others are required by law to report all attempted suicides in persons younger than 19 (23). Another approach to improve the completeness of reporting in an ED-based surveillance system may be to regionalize reporting from EDs in neighboring counties. Such an approach could be undertaken through existing trauma surveillance systems (24).

Nevertheless, we believe that ED-based surveillance may be among the least expensive and most useful strategies for monitoring trends and patterns in attempted suicide at the local level. We have demonstrated that such a data collection system in EDs is feasible and can yield useful information. Data from the surveillance system have been used in the practice of public health in Cobb County.

During the study, data were shared with local health, hospital, and school officials, leading to

closer working relationships among these persons. This collaboration has led to projects on childhood injury prevention with the primary health care and school health communities and involvement of private mental health practitioners in mental health crisis intervention in the county. The Cobb County Board of Health has strengthened its ties with the practicing medical and hospital communities. The surveillance data are currently being used to follow trends in the age and geographic distributions of persons attempting suicide, to detect new methods or drugs being used in suicide attempts, and to detect clusters of cases quickly to permit early intervention.

The surveillance system has opened the lines of communication among the public health department, school system, and community hospitals. Linkages among these diverse segments of the community have allowed better followup of high-risk students and have stimulated the implementation of new early intervention programs. These linkages may ultimately represent one of the most important benefits of suicide attempt surveillance in this Georgia county.

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